

Hot Spot Mobile Laboratory

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THE HOT SPOT MOBILE LABORATORY

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SUMMARY

The Lawrence Livermore National Laboratory (LLNL) Hot Spot Mobile Laboratory provides a uniquely developed and field-tested emergency response capability in radiation sample analysis for accidents involving nuclear weapons and radioactive materials. The Mobile Lab was designed to meet Air Force transport size requirements, to be self-sufficient, and to "hit the ground running." All equipment is kept in a ready state and can be set up and operational within an hour of arrival. The lab carries all consumable supplies needed to operate remotely in the field for several weeks and its truck houses a 40-kW generator capable of powering both the laboratory and sample preparation operations.

Analysis systems include gamma spectroscopy and a gross alpha/beta counter. Types of samples analyzed typically include soil, water, vegetation, bioassay, area swipes, nose swipes, and air filters. In addition, portable capabilities exist for wound, alpha, beta, and lung counting, as well as liquid scintillation counting. Portable field instrumentation, personnel protective equipment, and sample preparation supplies are carried, in addition to supplies to equip field teams for sampling assignments and to establish sample and data control systems.

Future capabilities include thin layer liquid chromatography for high explosives analysis and x-ray fluorescence.

BACKGROUND

The Hot Spot Mobile Laboratory was developed upon recognition of the need for the field characterization of samples taken at the site of a nuclear weapon accident. This asset has been in existence for almost 20 years and has been deployed to exercises throughout the United States and England.

Quick analysis of samples collected at the site of a nuclear weapons accident is essential to determine the state of a damaged weapon

system and to evaluate the health and safety concerns of rescue workers and the public.



LLNL Hot Spot Mobile Laboratory

The Laboratory is staffed by expert scientists and technicians from Lawrence Livermore National Laboratory who perform similar work in their routine jobs.

The Mobile Laboratory is specially designed to be loaded for transport by military aircraft (C-130, C-141, and C-5) and is maintained in a constant state of readiness.



Hot Spot Truck

The Hot Spot Laboratory consists of a truck, trailer, and portable sample preparation shelter. The truck carries survey equipment, personnel protective equipment, liquid nitrogen, tents, and other supplies necessary to operate for several weeks. The truck also doubles as a 40-kW generator capable of powering the

laboratory, sample preparation, and sample control.

An air-conditioned, UPS-powered trailer houses the majority of the analytical equipment. It provides a sheltered environment that allows scientists to work in inclement weather. The trailer contains several gamma spectroscopes (4 lead-shielded HP Ge and 4 NaI detectors), large capacity alpha/beta swipe and filter counter, liquid scintillator, alpha spectroscope, and special equipment for field and personnel evaluation of plutonium contamination.

The safe handling of the high specific alpha activity samples is of primary importance. The Hot Spot Team fields equipment and experts to quickly and accurately analyze high-hazard contamination in the field.



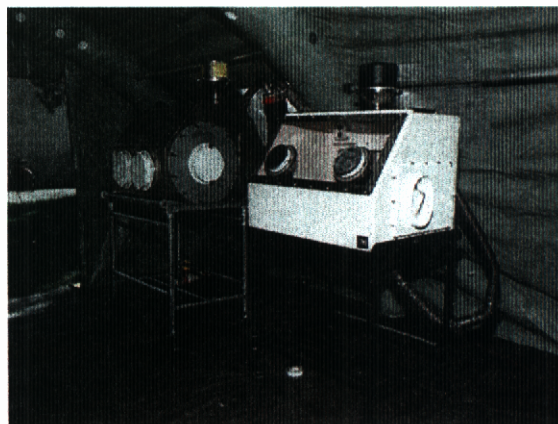
Hot Spot team processing samples

Hot Spot personnel provide tools and procedures to field teams to ensure that measurements and samples are properly taken.



Sample control kit

Upon return, field teams are debriefed by sample control personnel and the data or samples obtained are quickly forwarded on to those who need the information. Samples are prepared for laboratory analysis.



Samples are prepared in HEPA-filtered gloveboxes staffed by LLNL plutonium facility technicians

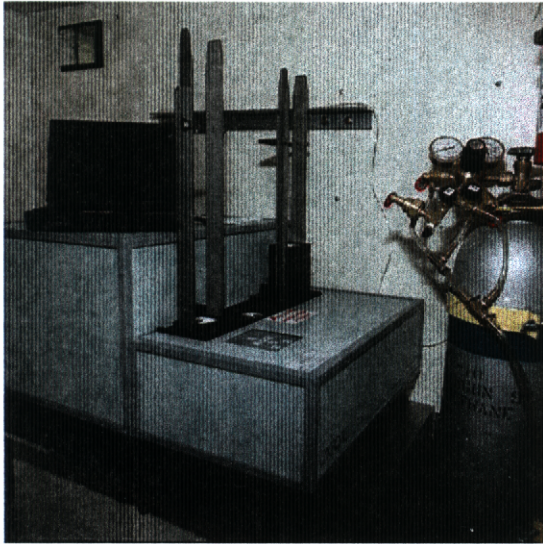
Once prepared in a standard counting configuration, the samples are forwarded to the laboratory for analysis. A variety of analysis techniques are available for sample analysis.



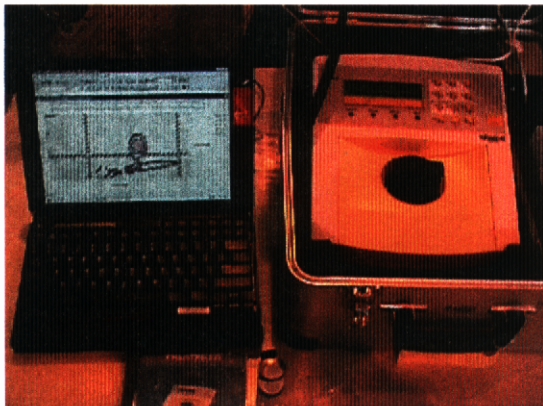
Lead-shielded HP Ge gamma spectroscope

Special portable analysis equipment is also carried to help establish personnel contamination and exposure. In an accident involving plutonium, quick evaluation of personal uptake can initiate timely medical intervention to reduce the person's dose.

Future developments with the Hot Spot Mobile Laboratory include collaboration with the LLNL Forensic Science Center for field identification of high explosives via thin layer chromatography (TLC) and mass spectroscopy.



Large capacity gross alpha/beta proportional counter



Gross alpha/beta/tritium liquid scintillation analysis



Hot Spot Team performing a field lung count to determine Pu uptake



Portable wound counter to assess contamination that may be present in personnel injuries

CONCLUSIONS

The Hot Spot Mobile Laboratory is an asset used to analyze samples (some high hazard) from the field. Field laboratories allow the quick turnaround of samples needed to establish weapon condition and hazard assessment for the protection of responders and the public.

The Hot Spot Lab is configured to fly anywhere in the world and is staffed by expert scientists and technicians from Lawrence Livermore National Laboratory who perform similar functions in their routine jobs.

The Hot Spot Team carries sample control kits to provide responding field teams with the procedures, tools, and equipment for sample collection and field measurements. High-hazard samples brought back from the field are prepared for analysis in HEPA-filtered gloveboxes staffed by technicians from LLNL's Plutonium Facility. The samples are passed on to the Mobile Laboratory which carries a variety of radiological and chemical analytical equipment in portable configuration for use in the field. Equipment and personnel can also deploy special assets to local hospitals or the field for detection of plutonium in a lung or wound. Quick assessment of personnel contamination is essential for time-critical medical intervention.

In addition to pulling the trailer, the Hot Spot Truck also stores some of the equipment, consumables, and a PTO generator. The Hot Spot Laboratory has the capability to be self-sufficient for several weeks when deployed.

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